# CSC 261/461
# Database Systems

# Instructor

Name: **Eustrat Zhupa (Eustrat)**

Office: **2107 Wegmans Hall**

Office Hours:

- Wed 2:15 – 4:00
- Thu 5:00 – 6:00
- By email

Website: **http://www.cs.rochester.edu/u/ezhupa/**

# Course Information

| | |
|---|---|
| Code: | **CSC 261/461** |
| Name: | **Database Systems** |
| Lecture: | Mon**/Wed 12:30 – 1:45** |
| Classroom: | **Harkness 115** |
| Website: | **http://www.cs.rochester.edu/u/ezhupa/dbs/t/** |

# Mechanics

| | |
|---|---|
| Lecture: | **2 x 1.25 hours/week** |
| Workshop: | **1.25 hours/week** |
| Projects: | **3-4/semester** |
| Problems: | **≈ 1/week** |
| Quizzes: | **≈ 1/week** |
| Homework: | **Grad students** |
| Paper: | **Grad students** |


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# Grading

| Percentage score | Letter grade |
|---|---|
| 90-100 | A |
| 85-89 | A- |
| 80-84 | B+ |
| 75-79 | B |
| 70-74 | B- |
| 65-69 | C+ |
| 60-64 | C |
| 55-59 | C- |
| 50-54 | D |
| 0-49 | F |

# Readings

- Lecture notes
- Textbooks:
  + “Fundamentals of Database Systems”, Elmasri, Navathe
  + “Database Systems: The Complete Book”, Garcia-Molina, Ullman, Widom
  + “Database System Concepts”, by Silberschatz, Korth & Sudarshan.

# Support

- Instructor (Eus)
- Teaching Assistants

Haosen Wen

Fri 2 – 3:30, Mon 1:45 – 3:00

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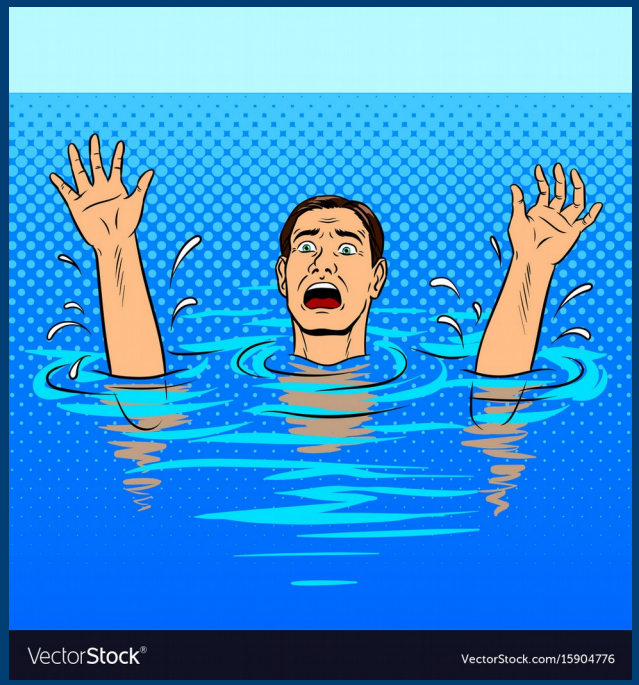
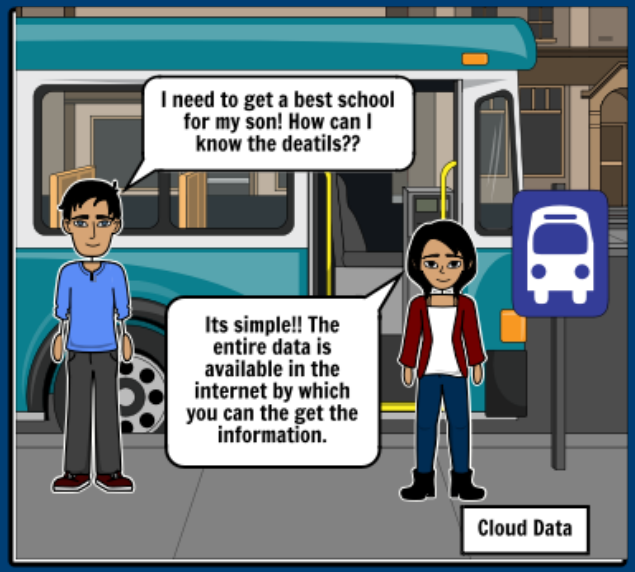
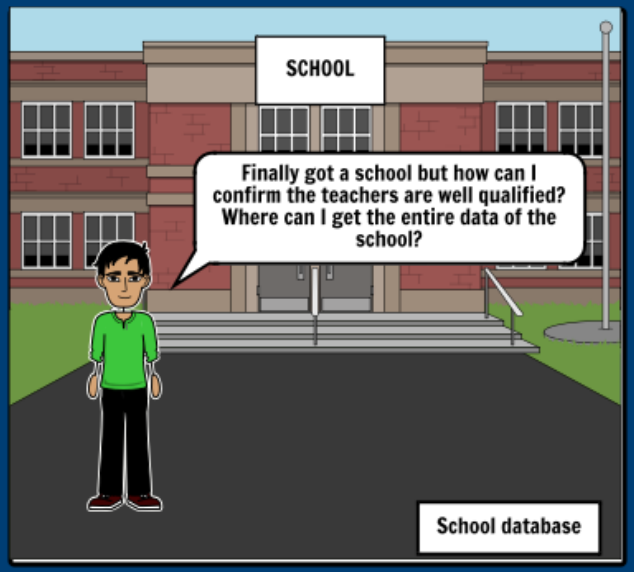
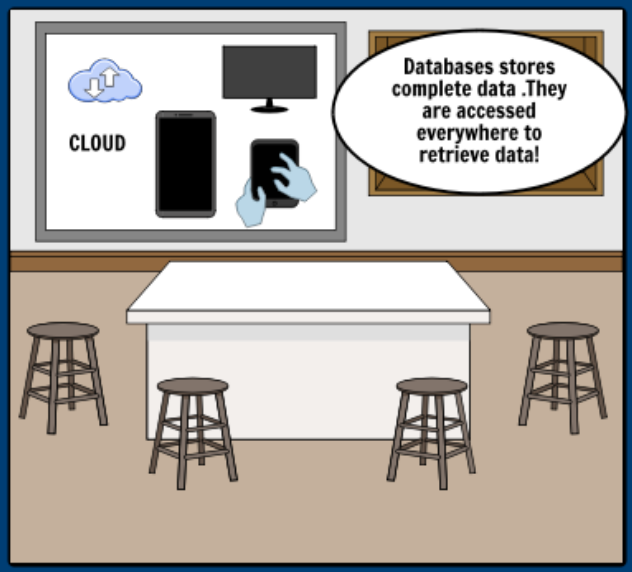
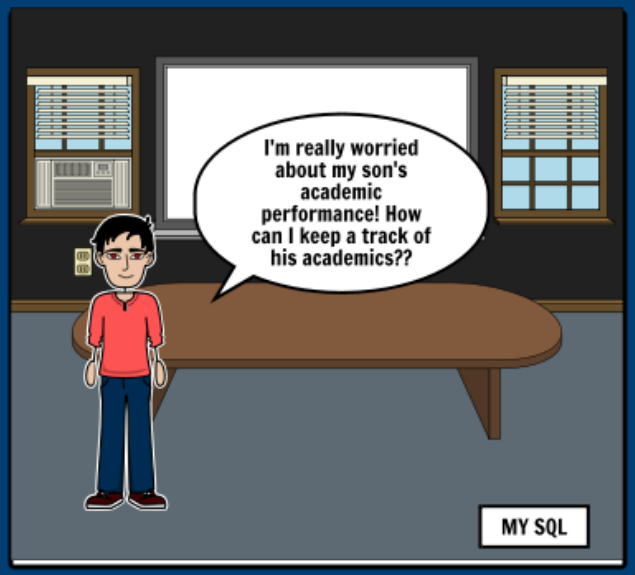


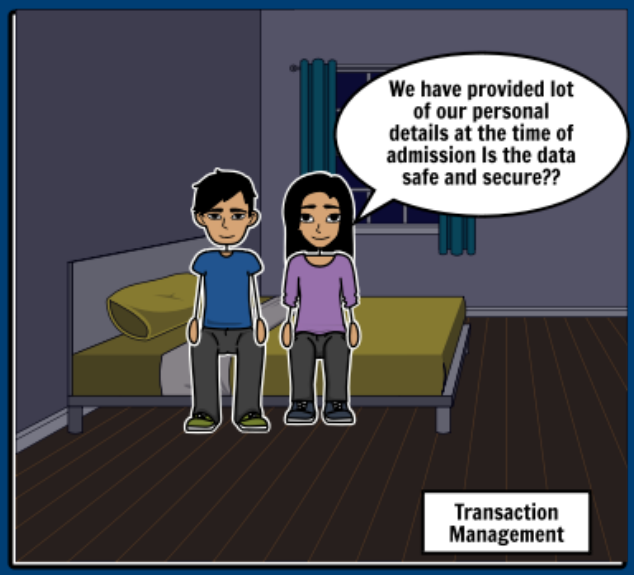
# Why Databases?

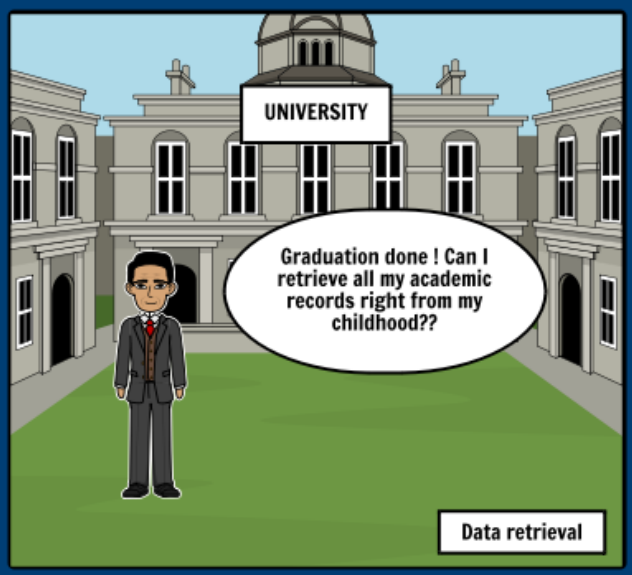


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# Databases Everywhere

1. Online Television Streaming
2. Social Gaming
3. Personal Cloud Storage
4. Sports
5. Finances
6. Government Organizations
7. Social Media
8. E-Commerce
9. Healthcare
10. Weather

# Types of Databases and Applications

Traditional Applications:

- Numeric and Textual Databases

More Recent Applications:

- Multimedia Databases
- Geographic Information Systems (GIS)
- Biological and Genome Databases
- Data Warehouses
- Mobile databases
- Real-time and Active Databases

Based on slides from Elmasri-Navathe

# Recent Developments (1)

Social Networks started capturing a lot of information about people and about communications among people- posts, tweets, photos, videos in systems such as:

- Facebook
- Twitter
- Linked-In

All of the above constitutes data

Search Engines- Google, Bing, Yahoo : collect their own repository of web pages for searching purposes

# Recent Developments (2)

New Technologies are emerging from the so-called non-database software vendors to manage vast amounts of data generated on the web:

- Big Data storage systems involving large clusters of distributed computers
- NOSQL (Not Only SQL) systems
- A large amount of data now resides on the “cloud” which means it is in huge data centers using thousands of machines.

# Requirements

1. **Users can create their own databases**
2. **Users modify/retrieve data**
3. **Store large amounts of data over a long time**
4. **Recovery in case of failures**
5. **Control concurrent access**

# Basic Definitions

**Database:**

A collection of related data.

**Data:**

Known facts that can be recorded and have an implicit meaning.

**Mini-world:**

Some part of the real world about which data is stored in a database. For example, student grades and transcripts at a university.

**Database Management System (DBMS):**

A software package/ system to facilitate the creation and maintenance of a computerized database.

**Database System:**

The DBMS software together with the data itself. Sometimes, the applications are also included.

# Typical DBMS Functionality

*Define* a particular database: data types, structures, constraints

*Construct* or Load the initial database contents on a secondary storage medium

*Manipulating* the database:

- Retrieval: Querying, generating reports
- Modification: Insertions, deletions and updates to its content
- Accessing the database through Web applications

*Processing* and *Sharing* by a set of concurrent users and application programs – yet, keeping all data valid and consistent

# Application Activities Against a Database

Applications interact with a database by generating

- Queries: that access different parts of data
- Transactions: that may read some data and “update” certain values or generate new data and store that in the database

Applications must not allow unauthorized users to access data

Applications must keep up with changing user requirements against the database